DOCKET NO. 1747.1001

DECLARATION UNDER 37 C.F.R. 1.132

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Hitoshi IWASAKA et al.

Serial No: 09/930,159 Group Art Unit: 3749

Confirmation No. 1497

Filed: August 16, 2001 Examiner: RINEHART, KENNETH

For: NON-CONTACTING CONVEYANCE EQUIPMENT

DECLARATION UNDER RULE 132

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

I, Hideyuki Tokunaga, declare as follows:

1. I am skilled and knowledgeable in the field of non-contacting conveyance equipment by virtue of six years of work experience in the relevant field. I also possess one year of work experience in the analysis software field.

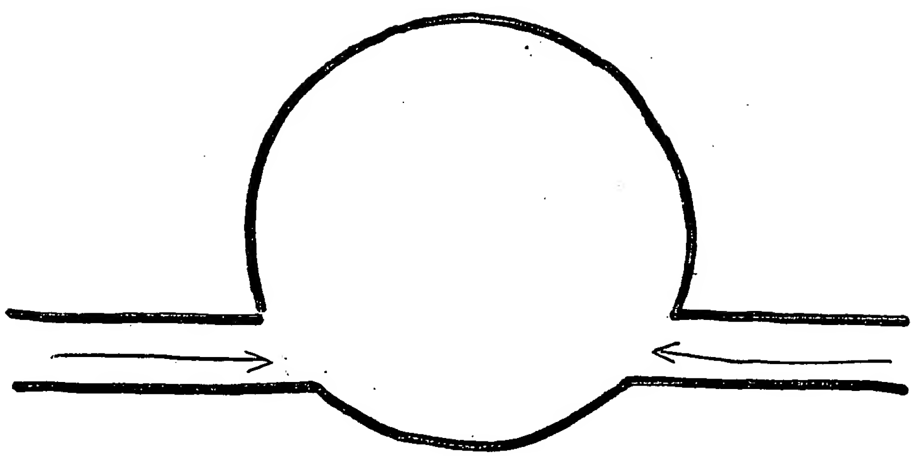
2. I have reviewed the experimental results attached as Exhibit A. I have reviewed the application and claims of U.S. Serial No. 09/930,159. I have also reviewed U.S. Patent No. 6,402,843 to Siniaguine et al. In light of the attached results, I find the performance of the present non-contacting conveyance equipment corresponding to independent claims 1 and 10 to be unexpectedly superior to that of U.S. '843 to Siniaguine et al. Specifically, the two-spout arrangement of the present invention results in more than twice the suction power of U.S. '843. Also, because the pressure distribution and the flow velocity on the water-side surface of the equipment are approximately symmetrical, the attitude of a held wafer is stabilized.

The Declaration further states that the above statements were made with the knowledge that willful false statements and the like are punishable by fine and/or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that any such willful false statement may jeopardize the validity of this application or any patent resulting therefrom.

By: Hideyuki Tokunaga
Hideyuki Tokunaga

Date: March 16, 2004

EXHIBIT A



APR 12 2004
PATENT & TRADEMARK OFFICE

RECEIVED
APR 19 2004
TECHNOLOGY CENTER R3700

Effects of a plurality of nozzles

CUP40

Flow (SLM)	Suction (N) [Pressure (kPa)]				Magnification
(per one nozzle)	Nozzle×1		Nozzle×2		
5	0.084	[21]	0.247	[25]	2.94
10	0.477	[92]	1.268	[107]	2.66
15	1.175	[198]	2.631	[207]	2.24
20	1.970	[305]	4.009	[304]	2.04
25	2.796	[409]	5.470	[411]	1.96
				Average	2.37

CUP80

Flow (SLM)	Suction (N) [Pressure (kPa)]				Magnification
(per one nozzle)	Nozzle×1		Nozzle×2		
5	0.060	[21]	0.222	[28]	3.70
10	0.498	[92]	1.197	[111]	2.40
15	1.261	[198]	2.546	[208]	2.02
20	2.120	[305]	4.221	[310]	1.99
25	3.165	[409]	5.798	[419]	1.83
				Average	2.39

Nozzle×1

- The attitude of a holded wafer is unstabilized because the pressure distribution and the flow velocity are biased on the wafer-side surface (see Figs. 1-4, 6, and 7).
- A biased swirl is formed because the pressure distributin and the flow (flow velocity) in the cylindrical chamber are biased respectively (see Fig. 6).
- The pressure in Z11 section is lowest, and the pressure in the wafer-side surface is high, and therefore inefficient (see Fig. 6).

Nozzle×2

- It is efficient when a flow rate is lower, which lower rate is used for practical purposes (see above table).
- The pressure distribution and the flow velocity on the wafer-side surface are approximately symmetrical (see Figs. 5 and 8).
- A formed swirl is not biased becase the pressure distribution and the flow (flow velocity) in the cylindrical chamber are approximately symmetrical (see Fig. 5).
- The pressure on the wafer-side surface is lowest, therefore efficient (see Fig. 8).

February 2, 2004

Comparison of the Number of Nozzles of Non-contacting Conveyance Equipment by Fluid Analysis

(1) Model and Factor Separation

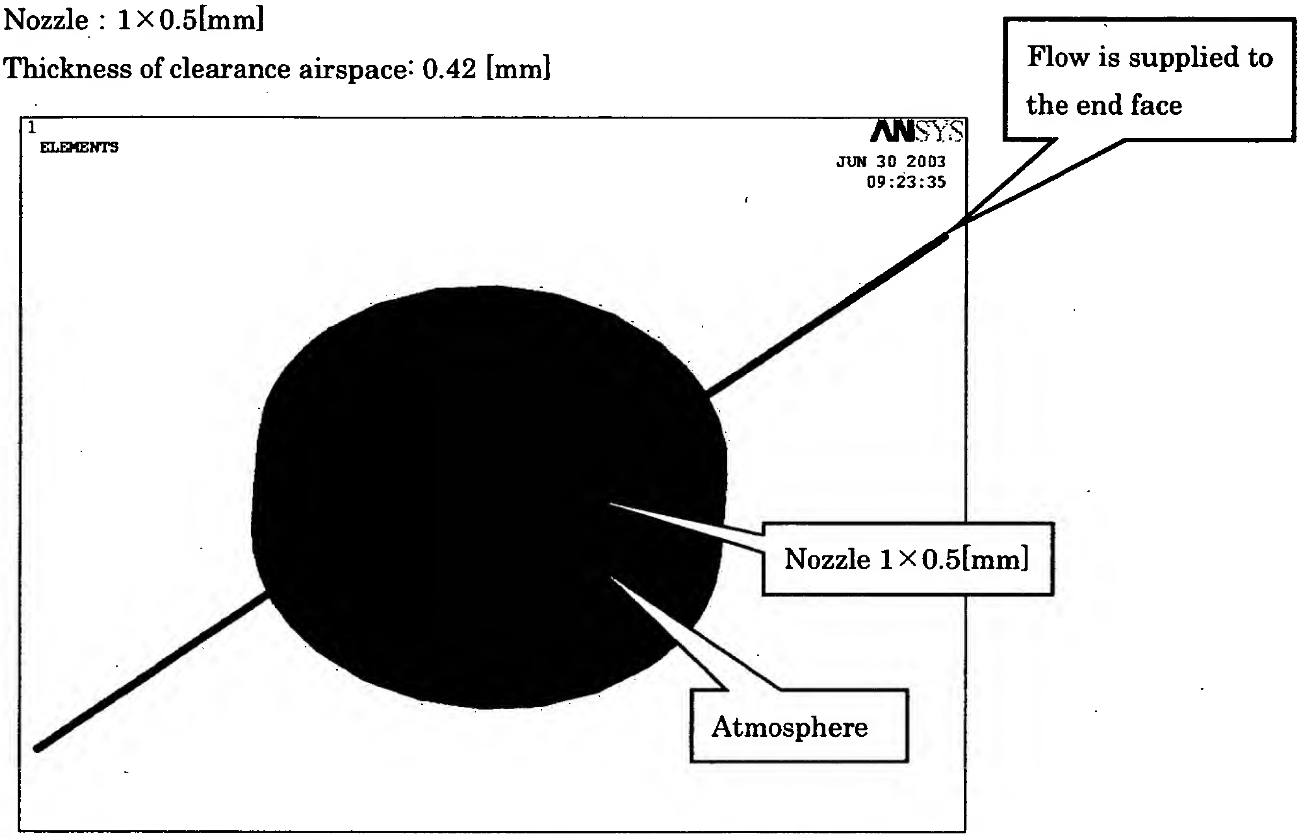
【Configuration · Model · Factor Separation】

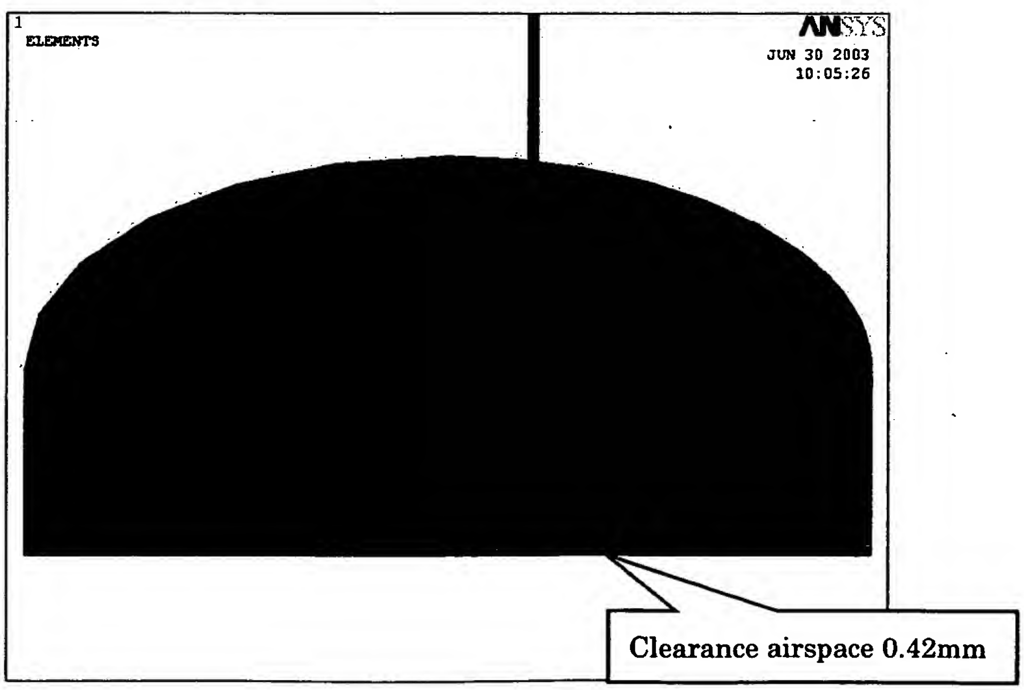
Three-dimensional model and International System of Units

ϕ 40 Cup

Nozzle : 1×0.5[mm]

Thickness of clearance airspace: 0.42 [mm]





(2) Comparison of the Number of Nozzles when Flows are the same (Flow Velocities are Different)

【Boundary Condition】

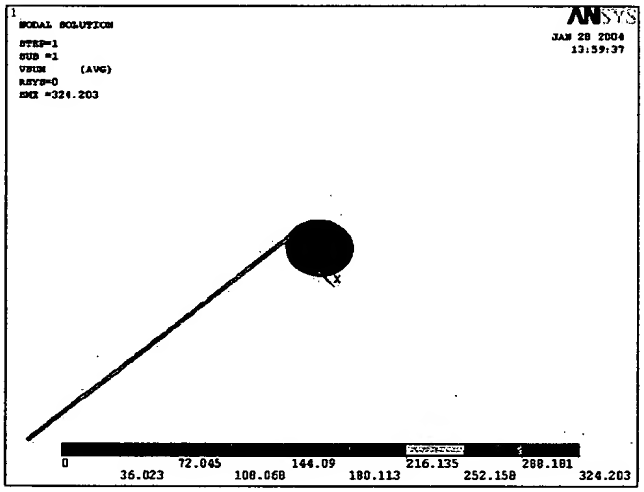
Flow : 5 [liters/min]

Flow velocity in nozzle section :

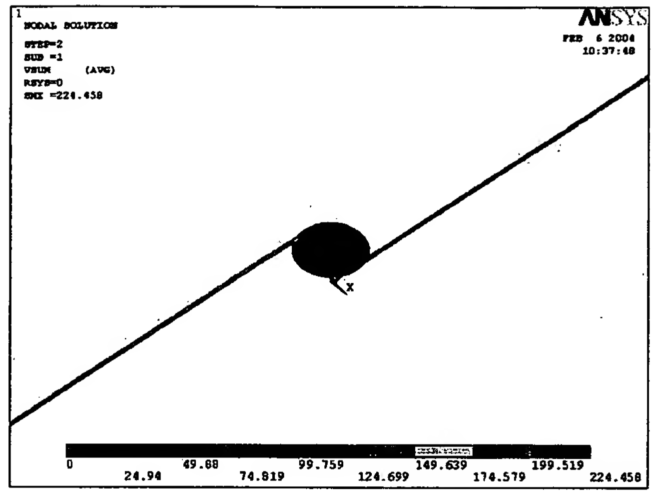
① One nozzle : 167 [m/s]

② Two nozzles : 83.5 [m/s]

【Flow velocity in nozzle section】



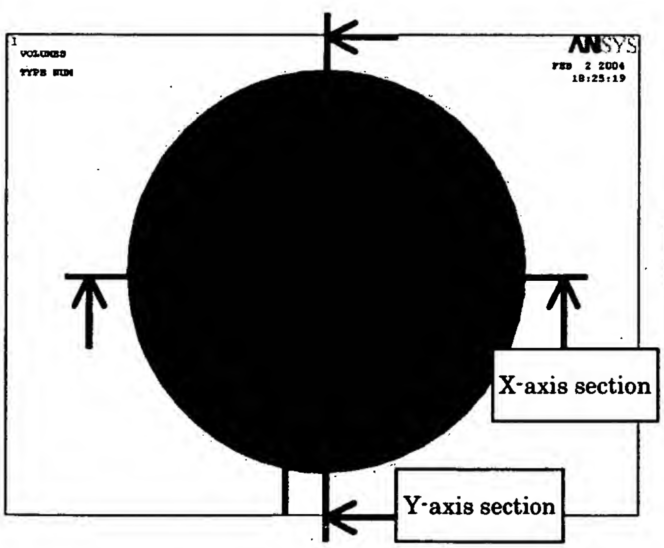
Flow velocity in nozzle section (one nozzle)



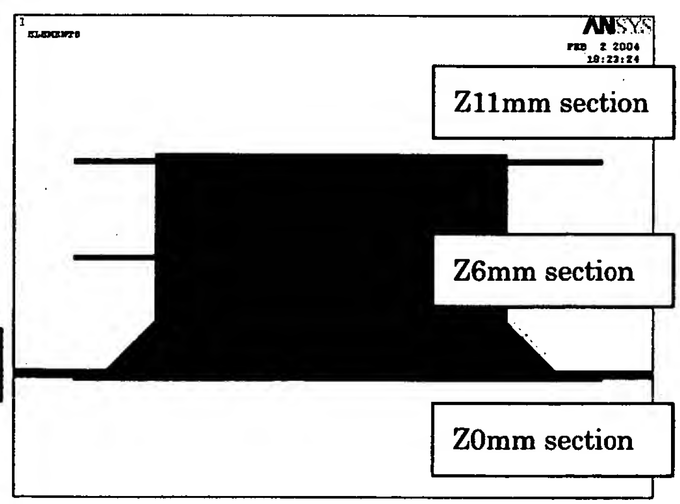
Flow velocity in nozzle section (two nozzles)

・The above figures show that max flow velocity is 324 [m/s] and 224 [m/s] respectively, and that the ratio is three to two.

【Explanation of sections】

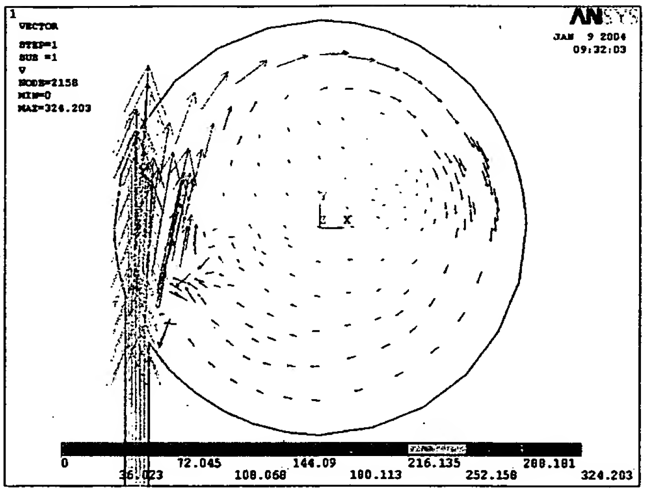


Top view

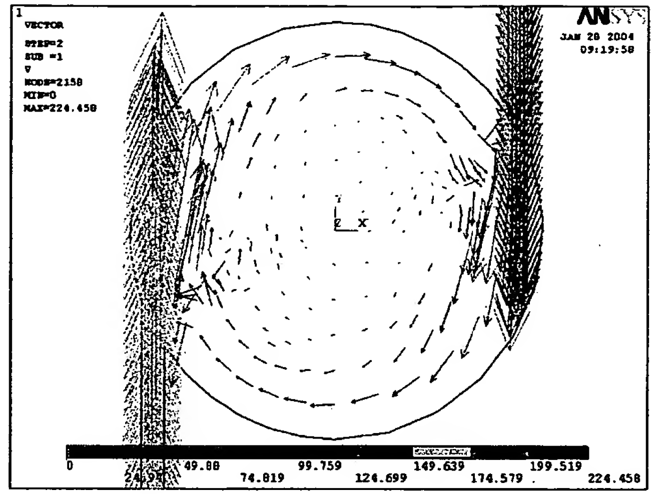


X-axis section

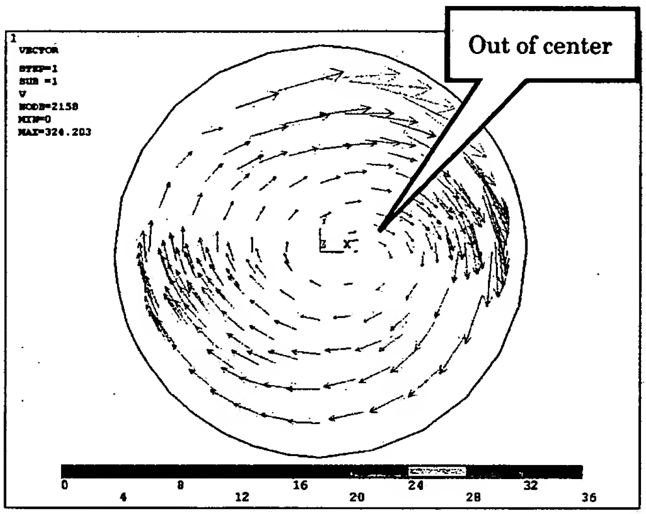
【Comparison of Flows (Flow Velocities)】



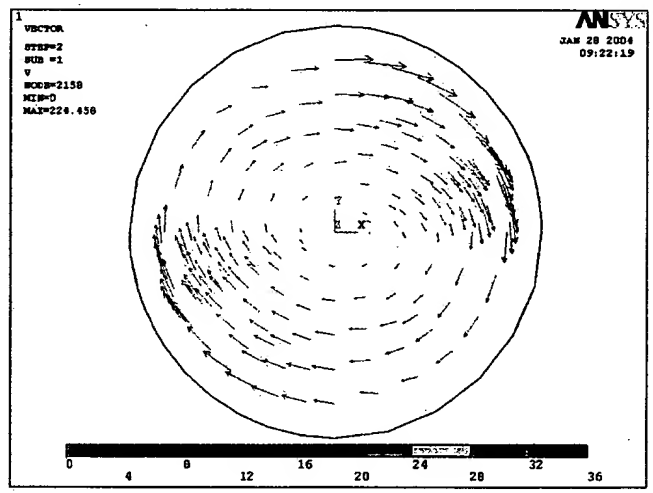
Flow velocity in Z11mm section (one nozzle)



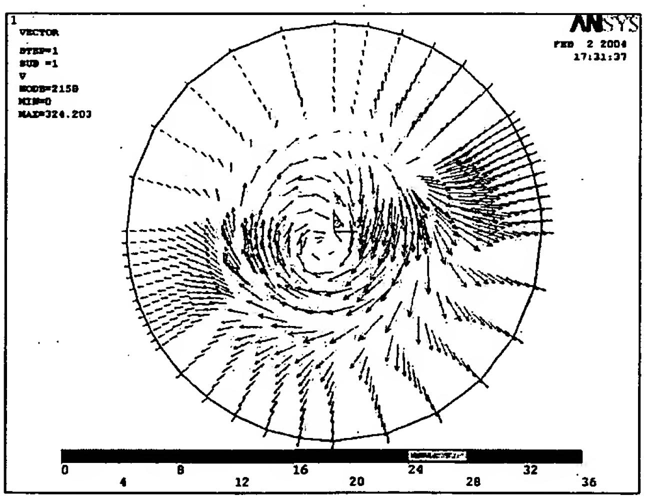
Flow velocity in Z11mm section (two nozzles)



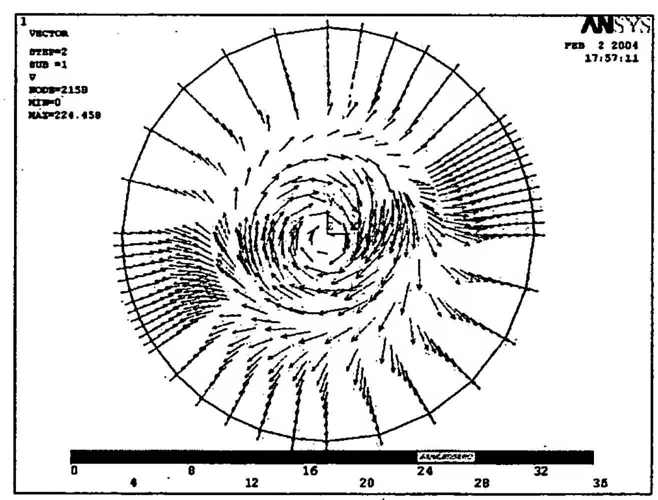
Flow velocity in Z6mm section (one nozzle)



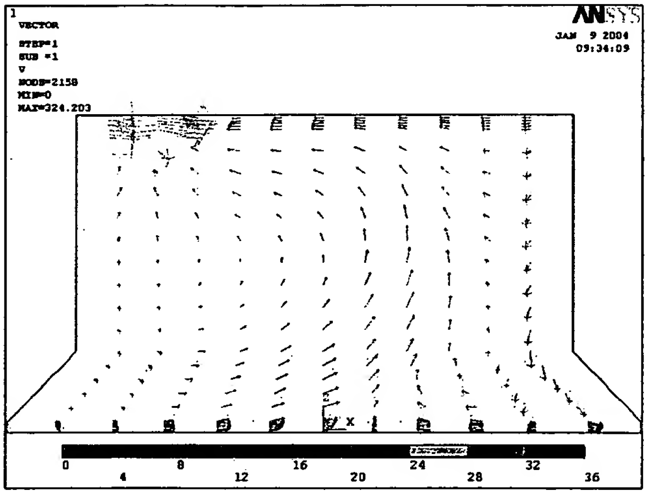
Flow velocity in Z6mm section (two nozzles)



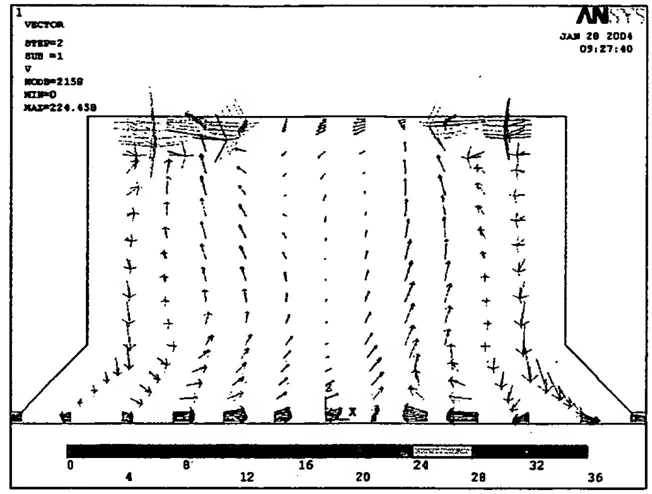
Flow velocity in Z0mm section (one nozzle)



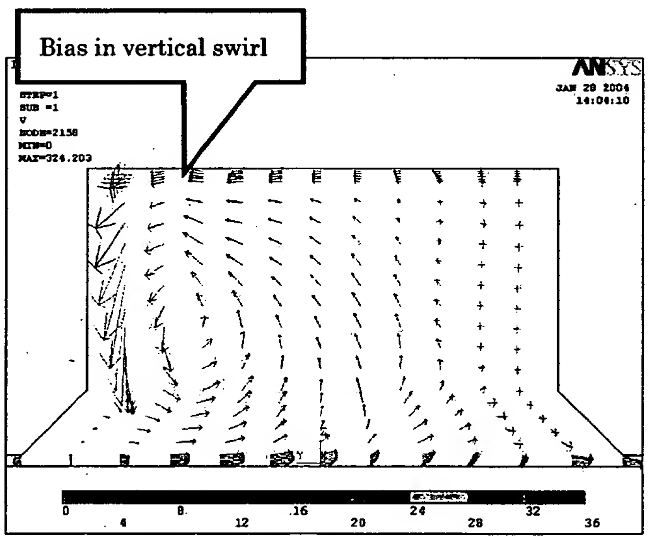
Flow velocity in Z0mm section (two nozzles)



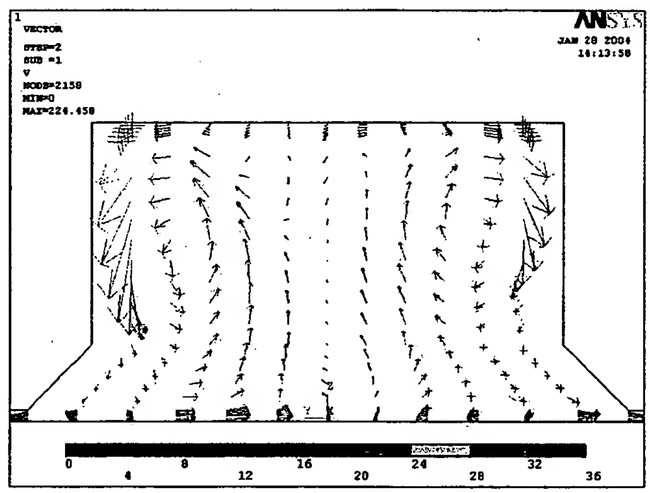
Flow velocity in X-axis section (one nozzle)



Flow velocity in X-axis section (two nozzles)

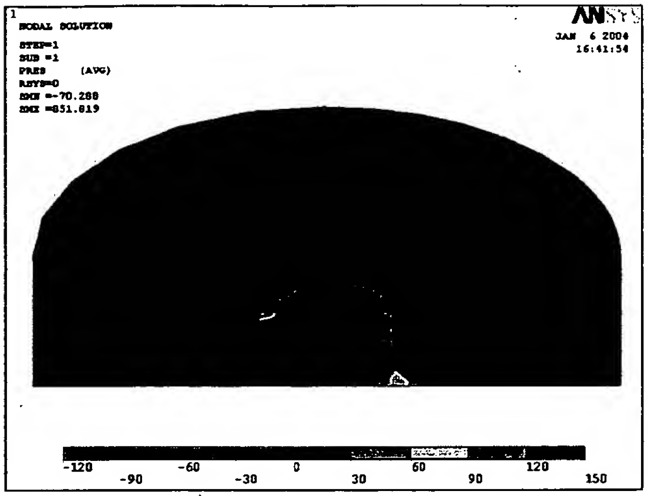


Flow velocity in Y-axis section (one nozzle)

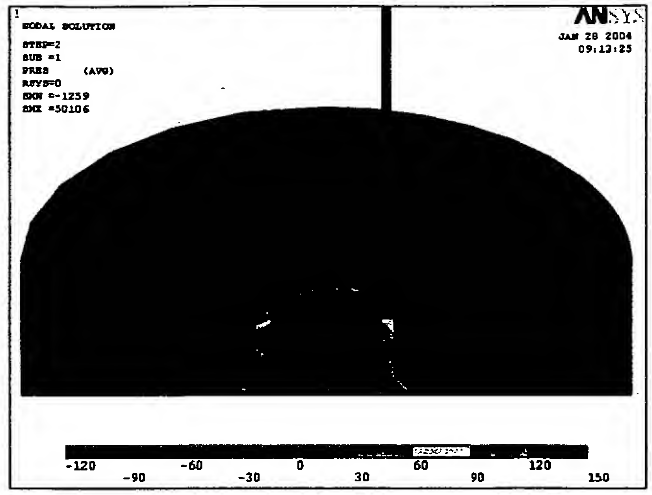


Flow velocity in Y-axis section (two nozzles)

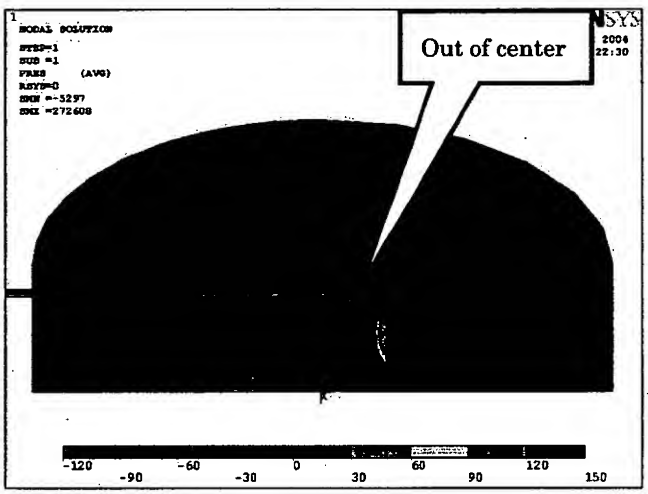
【Comparison of Pressure】



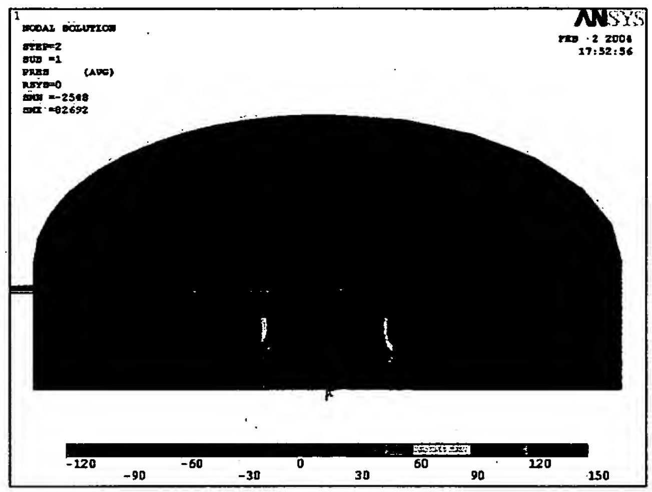
Pressure distribution in X-axis section (one nozzle)



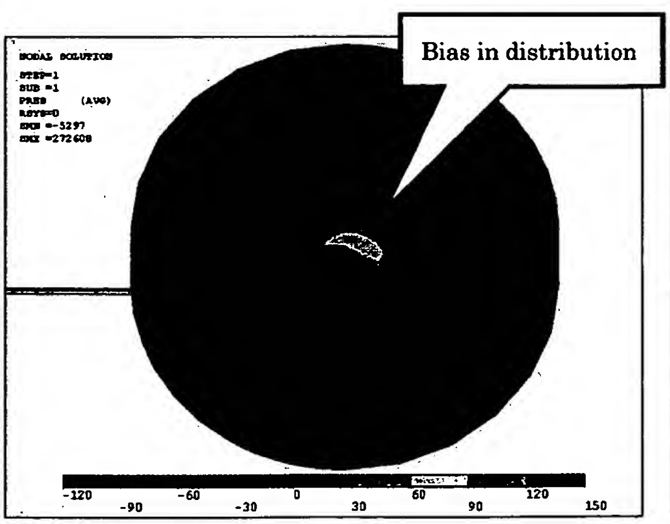
Pressure distribution in X-axis section (two nozzles)



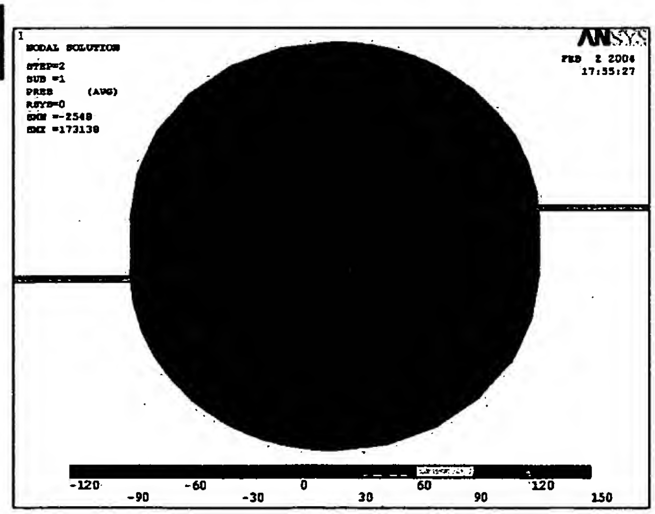
Pressure distribution in Y-axis section (one nozzle)



Pressure distribution in Y-axis section (two nozzles)



Pressure distribution in wafer-side surface (one nozzle)



Pressure distribution in wafer-side surface (two nozzles)

Minimum pressure in wafer-side surface: (one nozzle) -58.1[Pa], (two nozzles) -29.4[Pa]

(3) Comparison of the Number of Nozzles when Flow Velocities are the same (Flows are the Same)

【Boundary Condition】

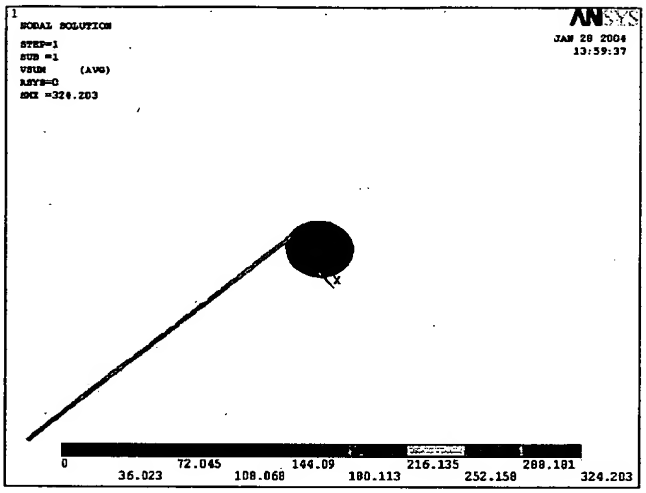
Flow : 167 [m/s]

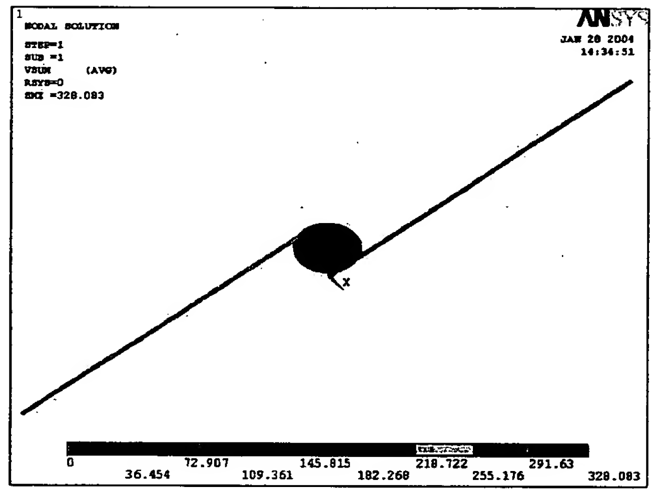
Flow velocity in nozzle section:

① One nozzle: 5 [liters/min]

② Two nozzles: 10 [liters/min]

【Flow velocity in nozzle section】

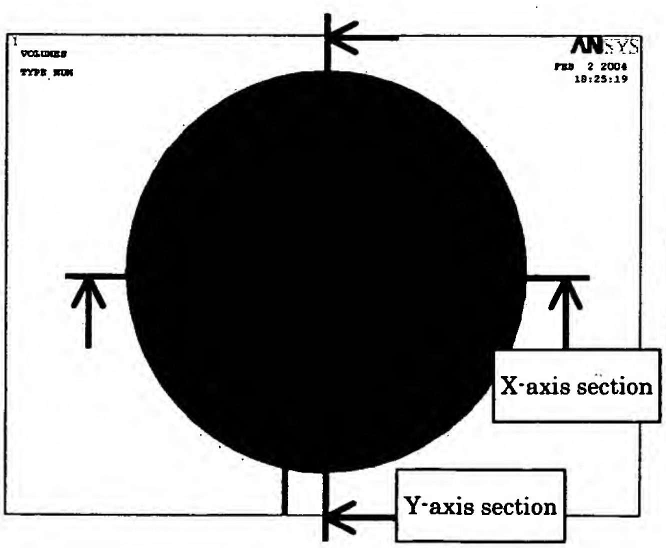


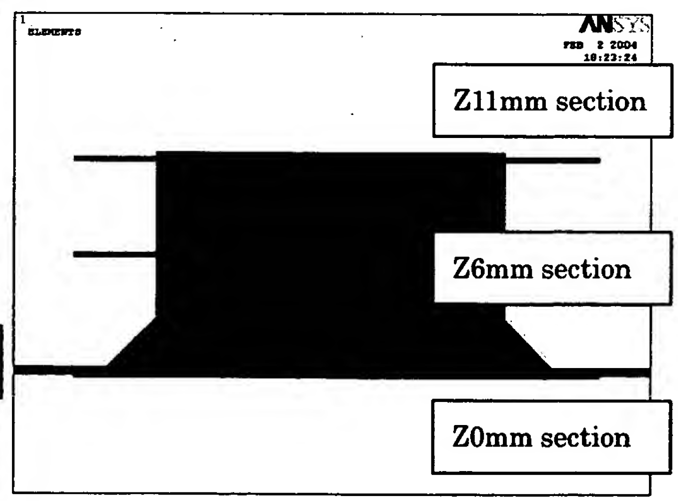


Flow velocity in nozzle section (one nozzle)　　Flow velocity in nozzle section (two nozzles)

· The above figures show that flow velocities are the same.

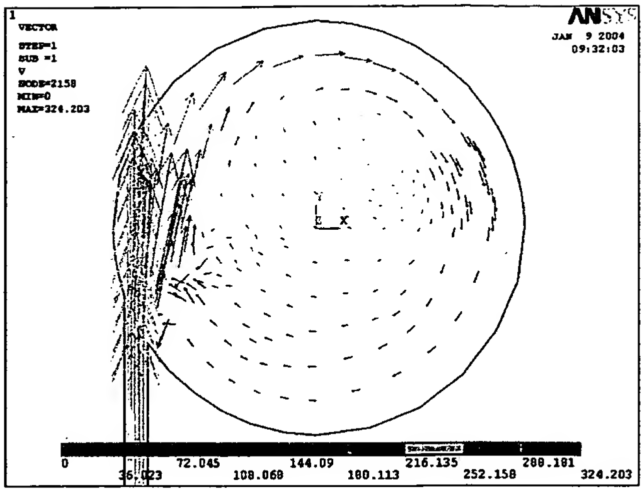
【Explanation of sections】



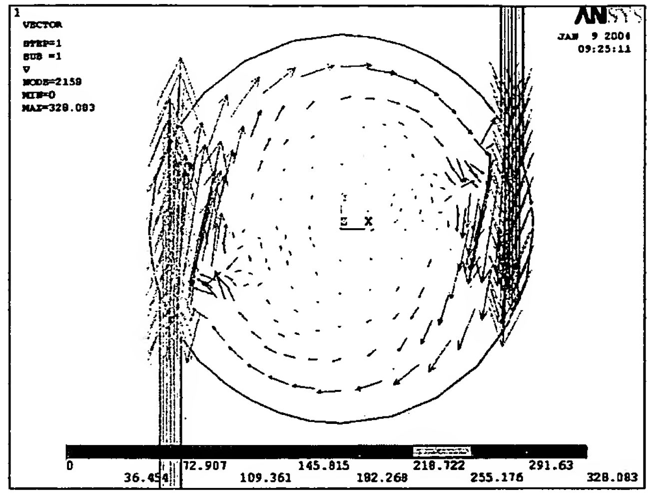


Top View　　X-axis section

【Comparison of Flow (Flow velocity)】



Flow velocity in Z11mm section (one nozzle)



Flow velocity in Z11mm section (two nozzles)

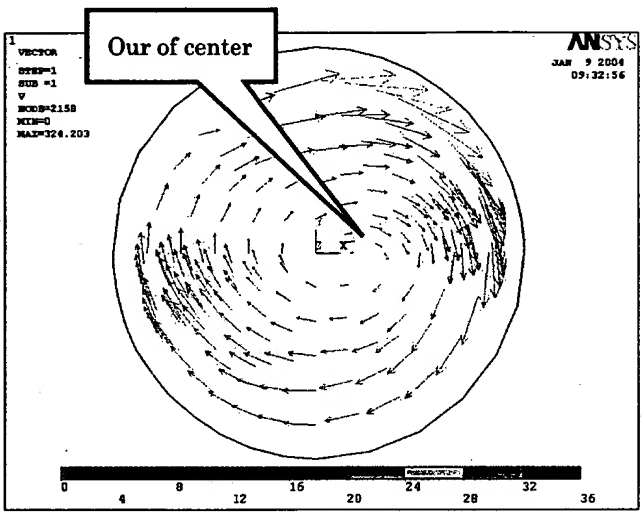
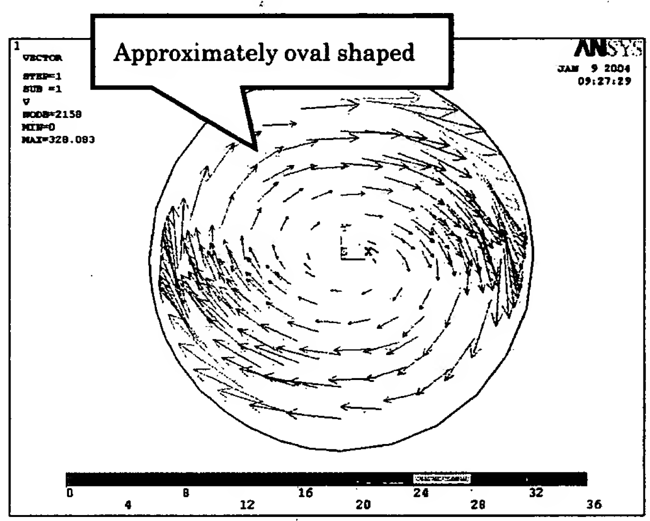


Fig.1 Flow velocity in Z6mm section (one nozzle)



Flow velocity in Z6mm section (two nozzles)

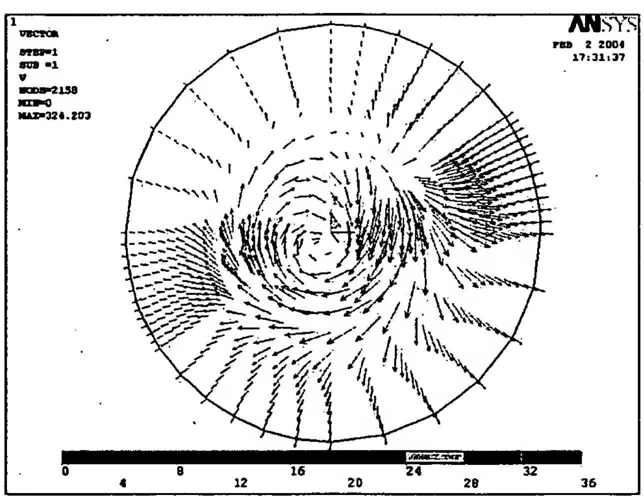
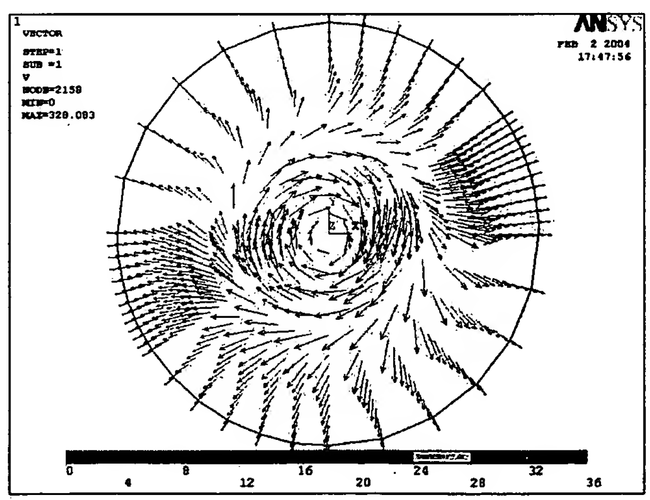


Fig. 2 Flow velocity in Z0mm section (one nozzle)



Flow velocity in Z0mm section (two nozzles)

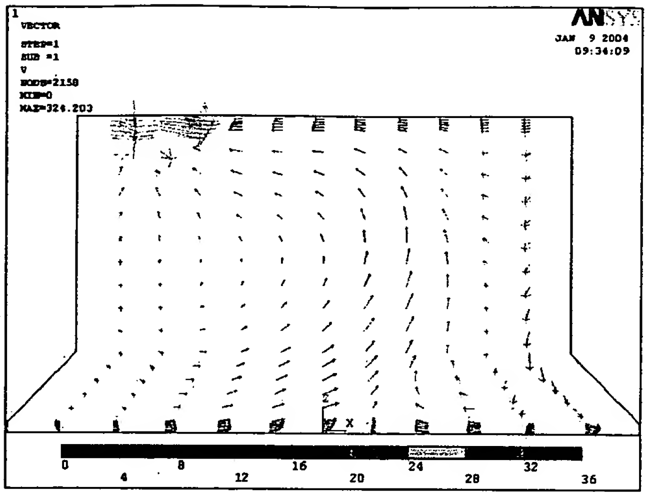
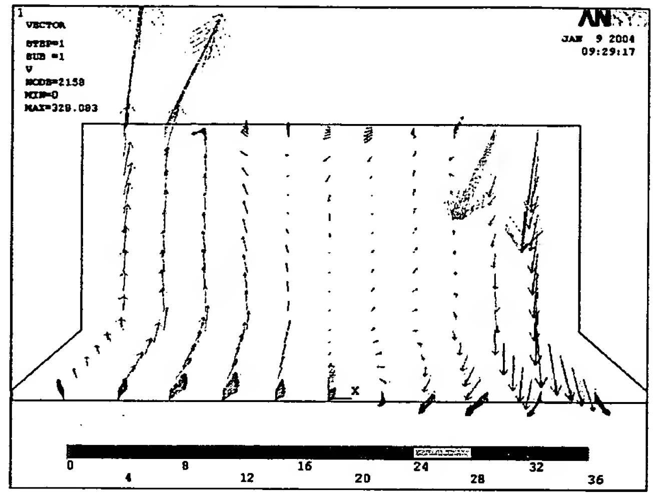


Fig. 3 Flow velocity in X-axis section (one nozzle)



Flow velocity in X-axis section (two nozzles)

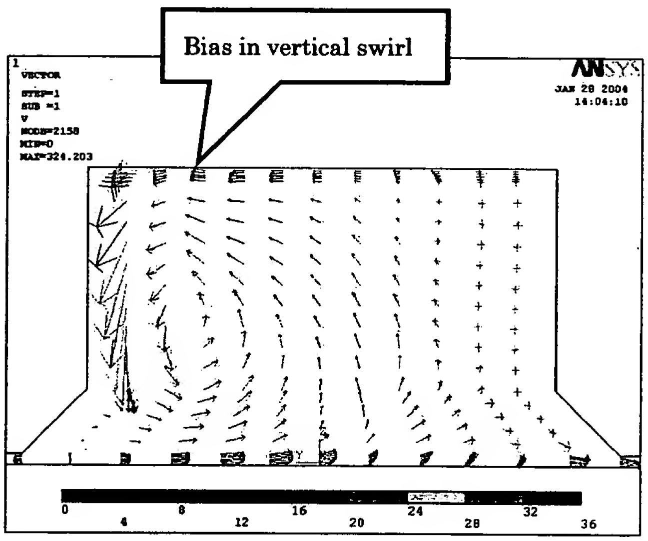


Fig. 4 Flow velocity in Y-axis section (one nozzle)

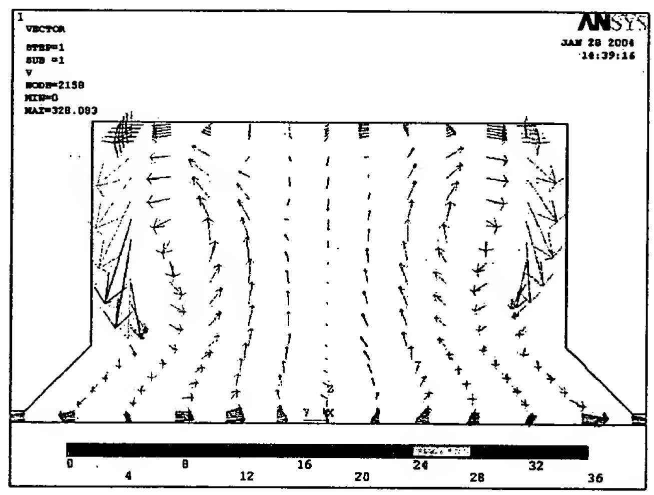
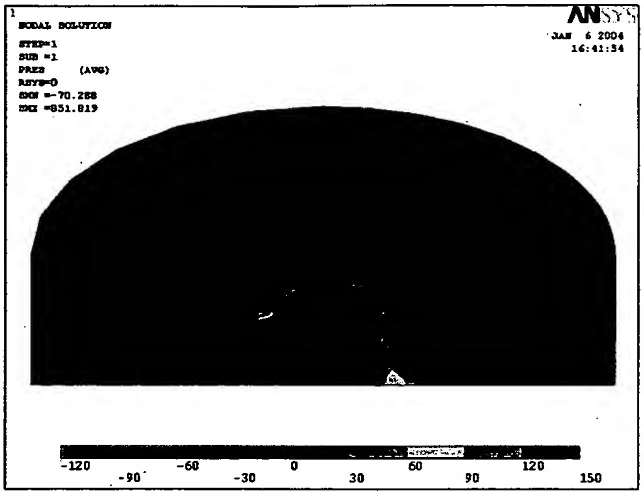
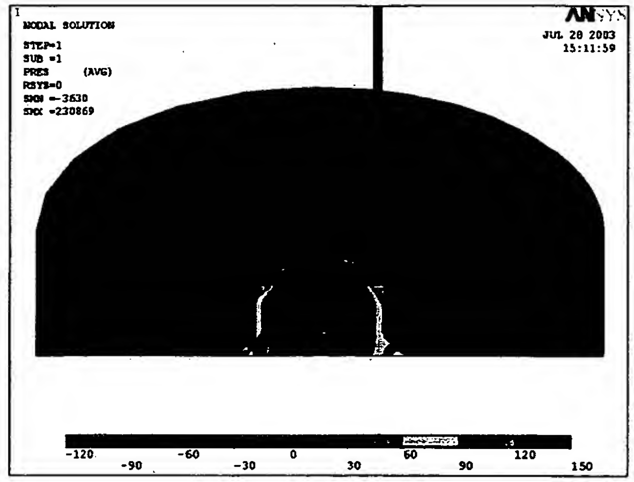


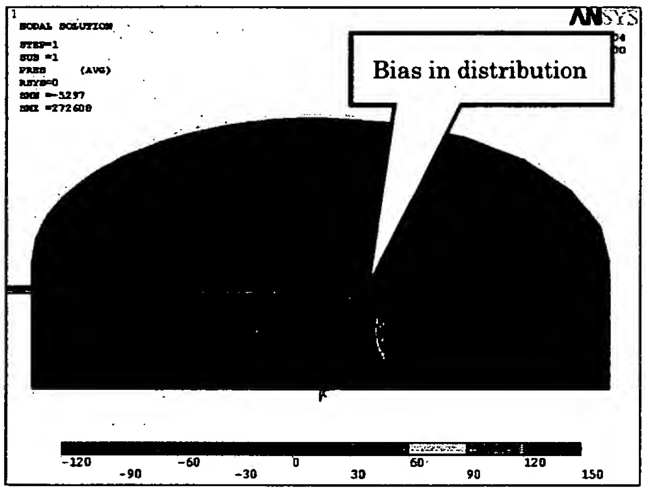
Fig. 5 Flow velocity in Y-axis section (two nozzles)

【Comparison of Pressure】





Pressure distribution in X-axis section (one nozzle) Pressure distribution in X-axis section (two nozzles)



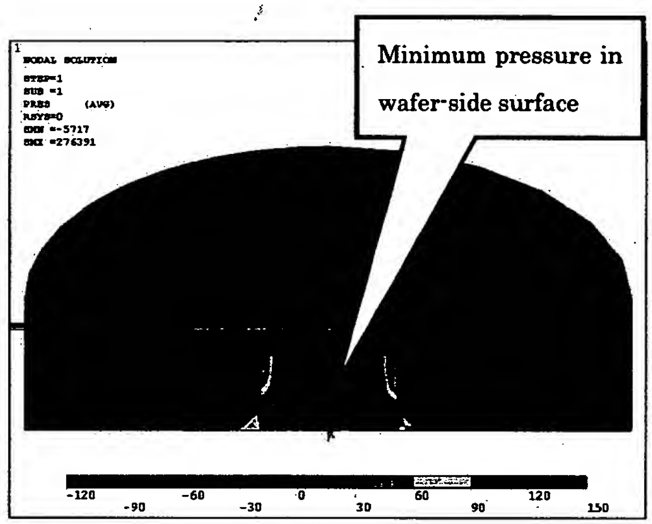
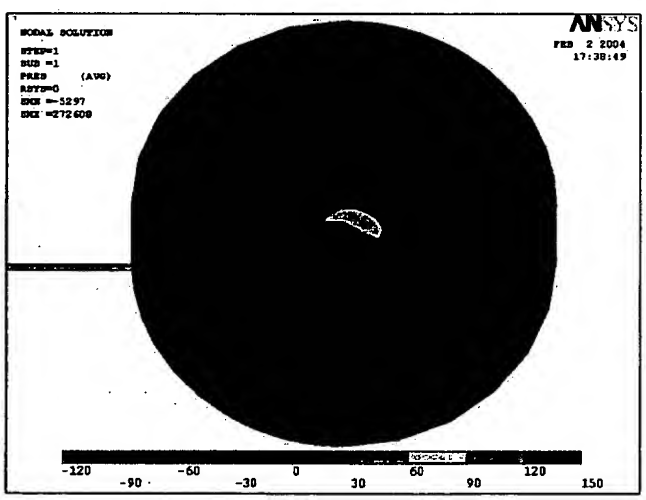


Fig. 6 Pressure distribution in Y-axis section (one nozzle) Fig. 8 Pressure distribution in Y-axis section (two nozzles)



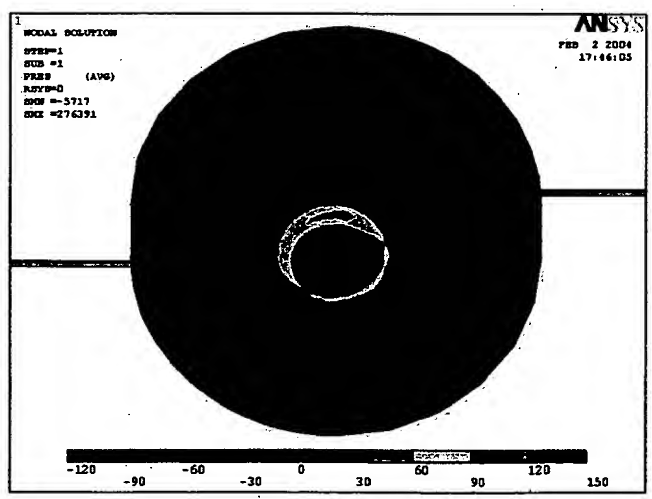


Fig. 7 Pressure distribution in wafer-side surface (one nozzle) Fig.9 Pressure distribution in wafer-side surface (two nozzles)

Minimum pressure in wafer-side surface: (one nozzle) -58.1[Pa], (two nozzles) -95.7[Pa]